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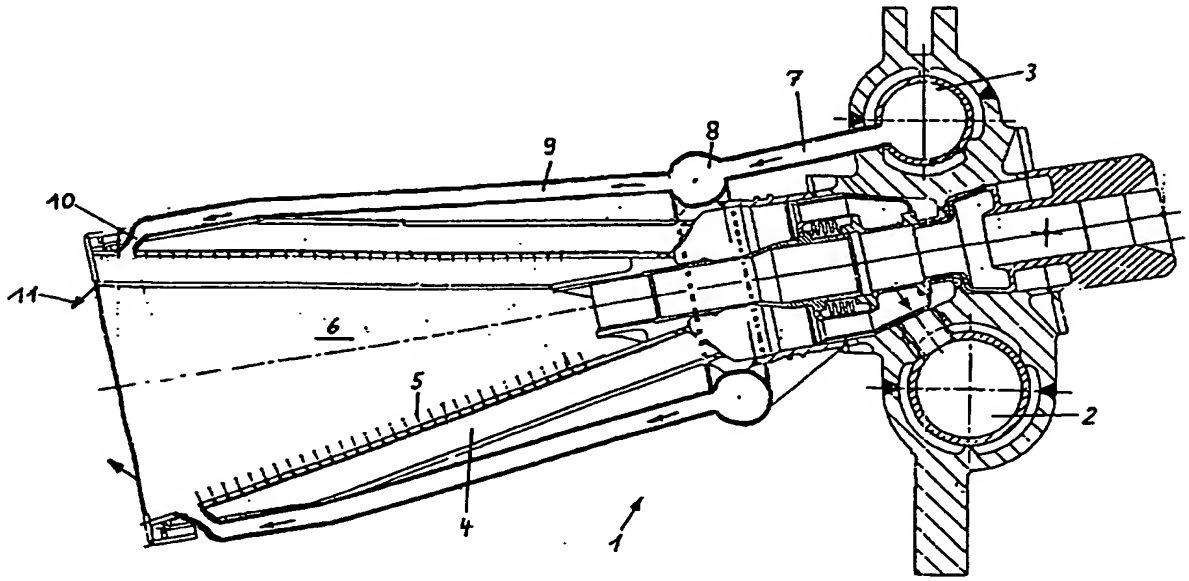
(54) Abstract Title
Method and apparatus for feeding pilot gas to the downstream end of a combustor

(57) The pilot gas is supplied at the end 10 of the burner cone by at least two pilot-gas lines 9, which run outside the burner wall. The pilot-gas lines 9 are curved inwards at their free end in accordance with the selected direction of flow of the pilot gas. They pass through that end region of the burner wall which faces the combustion zone. The pilot gas may be supplied in at least two different directions of flow.



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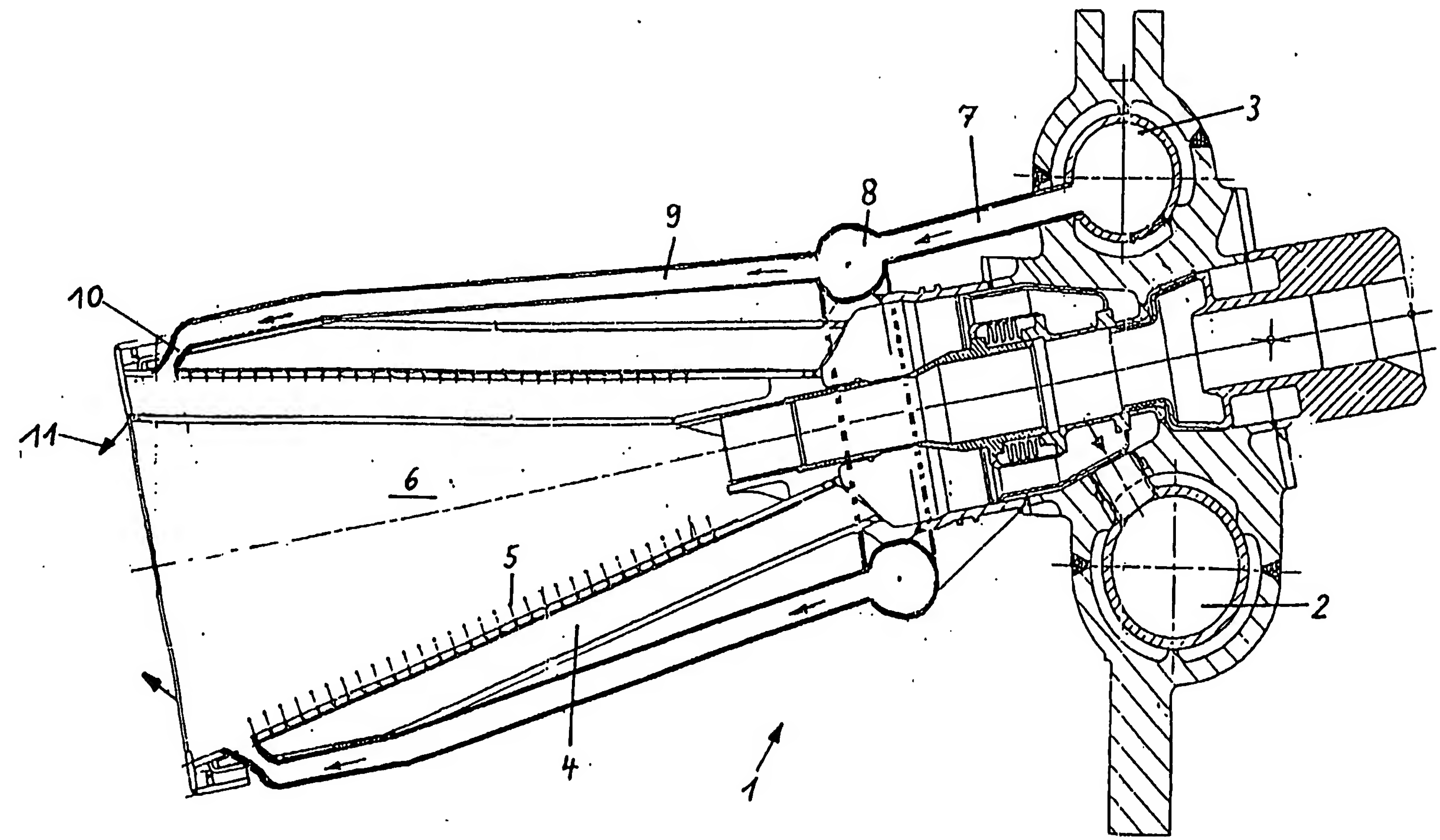
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Method of feeding a burner for gas turbines with pilot gas

Description

The invention relates to a method of feeding a burner for gas turbines with pilot gas, the burner being operated with premix gas and/or pilot gas, and the premix gas being prepared in a burner cone and the combustion zone of premix gas and pilot gas being arranged outside the burner cone, and also to a burner for carrying out the method.

Such generally known burners of gas turbines are operated with pilot gas during the start and in the low load range. A pilot-premix changeover is then effected. In this case, the pilot gas is supplied through a lance in the centre of the burner tip. As a result, however, the vortex core of the inflowing combustion air is disturbed. During the changeover to premix operation or during mixed operation with pilot and premix gas, pulsations occur, and these pulsations are so high that they markedly reduce the service life of the gas turbine. A further cause of the high pulsations is the long distance which the premix gas has to cover inside the burner until it burns outside the burner cone. During changes of flow, periodic, spontaneous, intense combustion also occurs inside the burner cone. Even a brief operation in this state can completely destroy the burners affected, which means failure of the entire machine.

The object is to specify a method of the type mentioned at the beginning and a burner for carrying out the method with which the pilot-gas combustion is reliably

effected outside the burner cone.

This object is achieved according to the invention by features specified in Claims 1 and 3.

Accordingly, the pilot gas is fed at the end of the burner cone and not as hitherto centrally at the start of the burner cone. The feed-line system for the pilot gas is connected to at least two pilot-gas lines, which run outside the burner wall. The feed-line tubes, which are curved inwards at their free end in accordance with the selected direction of flow of the pilot gas, pass through the burner wall at its end region facing the combustion zone. The pilot gas is supplied in at least two different predeterminable directions of flow.

With the measures according to the invention, the centrally arranged pilot-gas lance is dispensed with in the case of a purely gas-fired turbine, a factor which leads to considerable saving of material. The pilot gas fed from outside the burner in an obliquely directed pilot-gas flow leads to a low-pulsation operation and ensures high ignitability by at least two stable pilot flames per burner. After the ignition of the gas turbine in pilot operation, a premix-gas proportion can be switched on immediately without an adverse effect on the pulsation. By the premix gas being switched on at an early stage, the cyclic thermal loading of the turbine blading is reduced while simultaneously reducing the pilot flame. Furthermore, with the stable pilot flame outside the burner cone, premature ignition of the premix gas inside the burner cone is prevented.

Further advantageous refinements of the burner can be gathered from the subclaims.

The method according to the invention and a burner for carrying out the method are described with reference to an exemplary embodiment and a schematic figure.

The single figure shows a burner 1 of a gas turbine (not shown in any more detail). A multiplicity of the burners 1 are combined to form an annular burner. A feed-line system 2 feeds gas for the premix operation, whereas another feed-line system 3 serves to provide pilot gas. Via a gas passage 4 and its nozzles 5, gas flows into the interior space, designated as burner cone 6, of the burner and mixes there with supplied combustion air to become the premix gas.

From the feed-line system 3, the pilot gas passes via a connecting line 7 into a ring line 8, which may be positioned in the entire region along the burner cone. Two pilot-gas lines 9 advantageously run diametrically opposite one another in the longitudinal extent of the burner wall. At their end remote from the ring line 8, each pilot-gas line 9 is curved inwards. After the ignition of the pilot-gas flows, two stable pilot flames are produced per burner, and these pilot flames produce high ignitability for the premix gas flowing out of the burner cone 6. The pilot gas, which is fed in the opposite direction from outside the combustion-chamber wall, is inclined in its direction of flow in both the circumferential direction and in the main flow direction of the gas turbine. It may also contain a radial component relative to the burner axis. The size of the inclination can be adapted to the conditions. To avoid backflow inside the pilot-gas line 9, a cross-sectional constriction 10 is provided directly upstream of the pilot-gas discharge orifice. The arrow direction 11 symbolizes a possible direction of flow of the pilot gas to the combustion zone.

Patent Claims

1. Method of feeding a burner (1) for gas turbines with pilot gas, the burner being operated with premix gas and/or pilot gas, and the premix gas being prepared in a burner cone (6) and the combustion zone of premix gas and pilot gas being arranged outside the burner cone (6), characterized in that the pilot gas is fed at that end of the burner cone which faces the combustion zone.

2. Method according to Claim 1, characterized in that the pilot gas is supplied in at least two different directions of flow, which can be adapted to the conditions.

3. Burner for carrying out the method according to Claim 1, having a burner wall defining the burner cone (6) and having one feed-line system (2, 3) each for premix gas and pilot gas, characterized in that the feed-line system (3) for pilot gas is connected to at least two pilot-gas lines (9), which are arranged outside the burner wall, are curved inwards at their free end in accordance with the selected direction of flow of the pilot gas and pass through that end region of the burner wall which faces the combustion zone.

4. Burner according to Claim 3, characterized in that that part of the pilot-gas line which is curved inwards has a cross-sectional constriction (10) upstream of the discharge orifice of the pilot gas.

5. Burner according to Claim 3 or 4, characterized in that the feed-line system (3) for the pilot gas is connected via a connecting line (7) to a ring line (8), from which a predeterminable number of feed lines (9) for the pilot gas lead away.

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Claims searched: 1-5

Examiner: Paul Jenkins
Date of search: 21 May 2000

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.R): F4T (TAP, TAS, TAT, TAU, TAX1)

Int Cl (Ed.7): F23D 14/26; F23R 3/34

Other: Online: WPI, EPODOC, JAPIO

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X	GB 2287312 A	(TOSHIBA) See micro burner 5c	1
A	US 5885068	(ABB) See flow passages 4 in the figure	------

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.